

Lihang Liu

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EDUCATION BACKGROUND

Northwestern University

Program: Master of Computer Science

Evanston, USA

09/2019-05/2021

South China University of Technology (SCUT)

Program: Bachelor of Engineering in Computer Science and Technology

Guangzhou, China

09/2015-07/2019

PROFESSIONAL SKILLS

Programming Languages: Proficiency in C/C++, Java, Python, Golang, SQL, Shell

Service Components: Experienced with Kafka, Redis, Pulsar, ELK, Nginx, Netty, AWS

Service Framework: Skilled with Spring, Reactor

Research Interests: Distributed Systems, Computer Networking, Database, Computer Systems

RESEARCH EXPERIENCE

Advanced Persistent Threat (APT) Defense System Research

09/2020-04/2021

Lab: [Northwestern Lab for Internet and Security Technology](#)

- Implemented and built an Advanced Persistent Threat (APT) defense system, leveraging provenance graph, tag propagation, and state-based detection to defend APT attacks in real time.
- Utilized the *BeEF* penetration testing tool to simulate attacks on Linux systems, identifying system vulnerabilities and gathering kernel events data.
- Collected kernel tracing data using tools such as *LTTng* during simulated attacks, enriching the dataset for system testing, and conducted rigorous testing of the APT defense system using both the kernel events collected during *BeEF* hacking and open-source data, ensuring the system's effectiveness and resilience against real-world threats.

Linux Whitelist System Research

07/2018-08/2018

Lab: [Northwestern Lab for Internet and Security Technology](#)

- Designed and developed a Linux kernel module based on *ftrace* and the *proc* file system, enabling users to read and write *proc* files in user space to add executable file names to a whitelist.
- Applied *ftrace* technology, hooked the *sys_execve* system call to realize the judgment of process creation, effectively preventing the execution of processes not in the whitelist, thus enhancing security and stability.

Evolutionary Algorithms Research

09/2016-01/2017

Lab: SCUT Computational Intelligence Group

- Acquired a deep understanding of various intelligent computing algorithms, including the genetic algorithm, Particle Swarm Optimization (PSO), and simulated annealing algorithm, which involved reading and comprehending team papers, and programming these algorithms to solve optimization problems.
- Applied the PSO algorithm to personal desktop computer assembly decisions, crawled real data from e-commerce platforms and computer hardware benchmark scores to develop a software tool capable of helping users optimize choices for desktop computer configurations, considering factors such as cost, appearance, and performance.

In-depth Exploration of the Java Concurrency Framework (*java.util.concurrent* package)

02/2023-09/2023

- Conducted comprehensive research on the [java.util.concurrent](#) (JUC) package, delving into its source code and associated literature.
- Analyzed and compared various synchronizer implementations based on the Abstract Queued Synchronizer (AQS), summarizing their strengths, weaknesses, and appropriate use cases, documented in blog posts.

Personal Research in Distributed Systems

09/2023-Now

- Engaged in an in-depth study of the classic textbook, [Designing Data-Intensive Applications](#) (DDIA), and extensively reviewed its reference materials, investigated various strategies of data replication and data sharding, comparing their

advantages and disadvantages.

- Explored different distributed consensus algorithms, their strengths, weaknesses, implementations, and applications.
- Compared relational and document-oriented databases (NoSQL), and studied the design philosophy and implementation of distributed messaging systems, using Kafka and Pulsar as examples.
- Documented learning outcomes in blog posts, showcasing personal research results and insights in the field of distributed systems (work in progress).

WORK EXPERIENCE

Alibaba - ICBU (International Core Business Unit)

10/2023-03/2024

Position: Senior Software Development Engineer

Project 1: ICBU R-Lab AI Mid-stage Agent Mechanism and Framework Implementation

- Conducted in-depth research on industry ai agent design concepts and implementation, combined with the analysis of the source code of *LangChain*, implemented an agent framework suitable for the business needs of the departments based on Alibaba's internal technology stack.
- Assisted multiple business groups in transforming chain tasks into agent tasks on R-Lab platform, investigated multi-agent model and RAG technique thoroughly, shared research results with the team.

Project 2: Smart Search and Smart Assistant for *alibaba.com*

- Served as the leading developer, designed and implemented the backend services, and used llm to realize the features of user intent recognition and product and merchant retrieval through the newly launched *ReAct* Agent Framework.

Tencent - Tenpay

07/2021-09/2023

Position: Backend Development Engineer, WeChat Pay HK

Project 1: WeChat Pay HK Credit Card Payment Nativization Project

- Participated in the design, development, and launch of the WeChat Pay HK Card Payment nativization project, responsible for user module modification and implementation of algorithm code related modules.
- Worked closely with WeChat Pay and Tenpay Cryptography teams, actively participating in the design and development process of the algorithm code technique.
- Used scripts to verify the security of the algorithm code, learning and comparing the implementation details, differences, and pros and cons of batch code and algorithm code.

Project 2: WeChat Pay HK Card Linkage Module Refactor Project

- Led the technical solution design and development for the reconstruct of the WeChat Pay HK Card linkage module.
- Replaced old service framework with a new and much more powerful one.
- Implemented various excellent design patterns, such as BFF, Builder, etc. Make the system more reusable and extensible.

Project 3: WeChat Pay HK Bypass Log Reporting Project

- Solely responsible for the design, development, iteration upgrades, and maintenance of the WeChat Pay HK bypass log reporting system.
- The module is highly configurable, supports any log field's translation, filtering interception, detection in various channels, and has independent flow control capability for each reporting task.

Project 4: WeChat Pay HK Credit Card Business 3-Domain Secure 2.0 Upgrade Project

- Participated in and was responsible for the WeChat Pay HK credit card linkage's 3DS 2.0 upgrade project.
- Worked closely with Tenpay risk control team and Hong Kong MPGS organizations. Despite the extremely tight schedule, the requirement was successfully launched online with zero faults.